**Lesson 32 Crop Production Management in Greenhouse**

**32.1   Soil treatment**

Soil solarization is a method of heating soil by covering it with transparent polythene sheeting during hot periods to control soil borne diseases. The technique has been commercially exploited for growing high-value crops in diseased soils in environments with a hot summer (maximum daily air temperatures regularly exceeding 35°C). Examples include control of verticillium and fusarium diseases in vegetable crops in Israel, control of verticillium dahlias in pistachio orchards and control of chickpea and pigeon pea wilt in India. Although the major benefit of solarization is reduction of soil borne pathogens by soil heating effects, there are many other possible additional beneficial effects that can result in an increased growth response (IGR) of plants. Such additional effects include control of weeds and insect pests and release of plant nutrients.

Soil mixes used for greenhouse production of potted plants and cut flowers are highly modified mixtures of soil, organic and inorganic materials. When top soil is included as a portion of the mixture, it is generally combined with other materials to improve the water holding capacity and aeration of the potting soil. Many greenhouses do not use topsoil as an additive to the soil mixes, but rather use a combination of these organic and inorganic components as an artificial soil mix. When managed properly as to watering and fertilization practices, these artificial mixes grow crops that are equal to those grown in top soil.

**Media preparation for greenhouse production**

The media used in greenhouse generally have physical and chemical properties which are distinct from field soils.

* A desirable medium should be a good balance between physical properties like water holding capacity and porosity.
* The medium should be well drained.
* Medium which is too compact creates problems of drainage and aeration which will lead to poor root growth and may harbour disease causing organisms.
* Highly porous medium will have low water and nutrient holding capacity, affects the plant growth and development.
* The media reaction (pH of 5.0 to 7.0 and the soluble salt (EC) level of 0.4 to 1.4 dS/m is optimum for most of the greenhouse crops).
* A low media pH (<5.0) leads to toxicity of micronutrients such as iron, zinc, manganese and copper and deficiency of major and secondary nutrients while a high pH (>7.5) causes deficiency of micronutrients including boron.
* A low pH of the growth media can be raised to a desired level by using amendments like lime (calcium carbonate) and dolomite (Ca-Mg carbonate) and basic, fertilizers like calcium nitrate, calcium cyanamide, sodium nitrate and potassium nitrate.
* A high pH of the media can be reduced by amendments like sulphur, gypsum and Epsom salts, acidic fertilizers like urea, ammonium sulphate, ammonium nitrate, mono ammonium phosphate and aqua ammonia and acids like phosphoric and sulphuric acids.
* It is essential to maintain a temperature of the plug mix between 70 to 75ºF. Irrigation through mist is a must in plug growing. Misting for 12 seconds every 12 minutes on cloudy days and 12 seconds every 6 minutes on sunny days is desirable.
* The pH of water and mix should be monitored regularly.

**Gravel Culture**

Gravel culture is a general term which applies to the growing of plants without soil in an inert medium into which nutrient solutions are usually pumped automatically at regular intervals. Haydite (shale and clay fused at high temperatures), soft- or hard-coal cinders, limestone chips, calcareous gravel, silica gravel, crushed granite and other inert and slowly decomposing materials are included in the term “gravel”. The more important greenhouse flowering crops include roses, carnations, chrysanthemums, gardenias, snapdragons, lilies, asters, pansies, annual chrysanthemums, dahlias, bachelor buttons and others.

**32.2   Crop sequence**

Crops for growing in greenhouses should be selected carefully keeping in view the quality aspects and market price.

Vegetables

Off-seasonality should be the main criteria to fetch higher profits. Sweet pepper, tomato and cucumber

Flowers

Blooms as per market demand.

Depending on climate, rose, gerbera, anthurium, carnation, lillium, orchids, chrysanthemum

**Table 1 Crop sequence under the greenhouse**

|  |  |
| --- | --- |
| **Month** | **Crop** |
| Sept - Dec  Dec-Jan Jan-April              | CucurbitsSummer squash/CucumberVegetable nursery/CucurbitsSummer squash/Cucumber |

**32.3   Crop growth Parameters Monitoring**

Plant height, number of leaves, leaf area index (LAI), stalk length, flower diameter and yield per meter square area are the main growth parameters that describes the crop performance. Plant height, stalk length and flower diameter is measured by means of a meter scale with an accuracy of ±1mm. Leaf area of the plants in each treatment is measured by a planimeter by non-destructive sampling method. Leaf area Index (LAI) is derived from the total leaf area of the plant sample divided by the floor area occupied by the sample.

**32.4   Economic Analysis**

Economic analysis of greenhouse covered with UV stabilized film is carried out considering associated costs such as initial investment, cost of shade net, cost of cultivation including fertilizers, pesticides, drip and economic return through the yield during entire year. The service life of greenhouse is considered as 20 years and shade net, insect-proof nets of 3 years. The annual cost of the structure is computed using capital recovery factor (CRF) considering interest rate of 12%. The life of structure, cladding materials including shade net, Insect-proof nets and drip irrigation system is considered as 20 years, 3 years and 7 years, respectively. Using these data, net benefit, benefit-cost ratio andpay-back period is computed. The capital recovery factor is computed from the formula



Where,

i = rate of interest,

n = expected life of the component.

**Benefit cost ratio**

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Where,

Ct = Cost in each year,

Bt = Benefit in each year,

t = 1, 2, 3...n,

i = discount rate